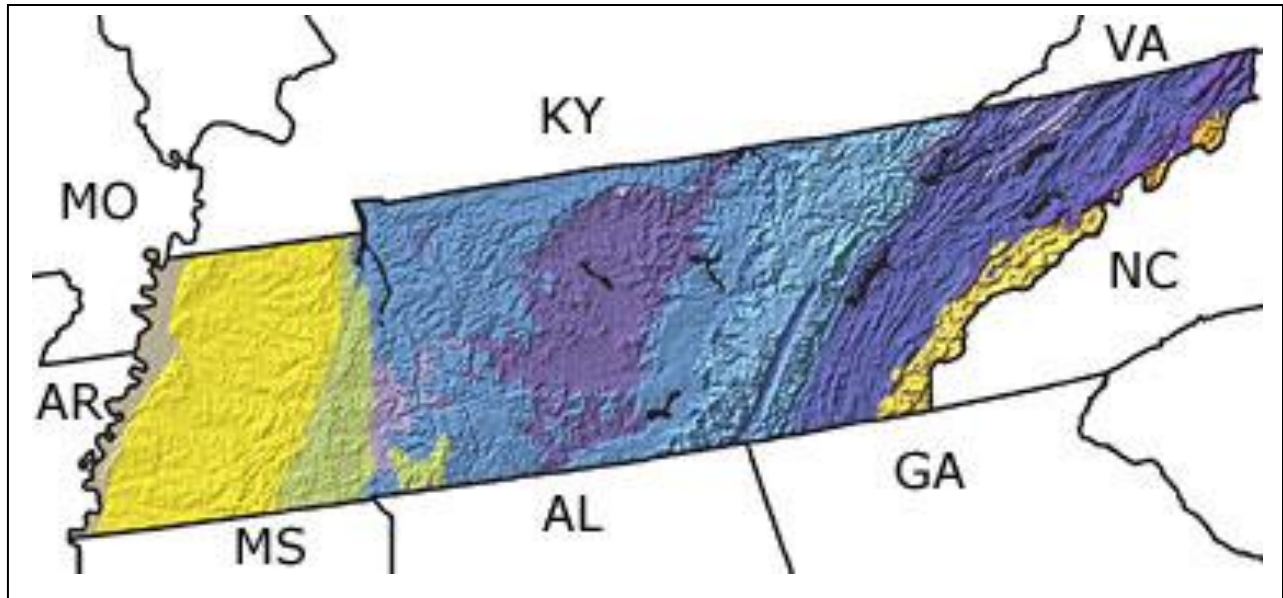


Tennessee – Paleontology and Geology Overview



The Precambrian: In the Precambrian, the future state of Tennessee lay beneath marine waters far south of the equator. Sediments that accumulated on the sea floor were later metamorphosed and intruded by molten material during mountain building. These igneous and metamorphic rocks are now exposed in the Blue Ridge Mountains along the eastern border of Tennessee.

The Paleozoic: During this time, Tennessee lay along the southern margin of future North America as the continent drifted north toward the equator. Shallow sea water covered the state through most of this interval (Cambrian through Early Carboniferous), and the sea floor was home to a variety of animals, including brachiopods, trilobites, crinoids, bryozoans, and corals. In the Late Carboniferous (Pennsylvanian), mountain-building to the east produced vast amounts of sediment that was carried by westward-flowing rivers into the shallow sea. Huge, swampy deltas developed. These low-lying areas were lush with scale trees, horsetail rushes, and other plants that would eventually produce Tennessee’s coal deposits. The state lay above sea level by the end of the era, and erosion outpaced deposition.

The Mesozoic: Tennessee lay above sea level for much of the Mesozoic, and erosion outpaced deposition. The sea advanced across the western part of the state in the Cretaceous, bringing a return to marine conditions in that region. Crinoids, clams, oysters, and snails thrived in the shallow waters, while dinosaurs walked the dry land farther east.

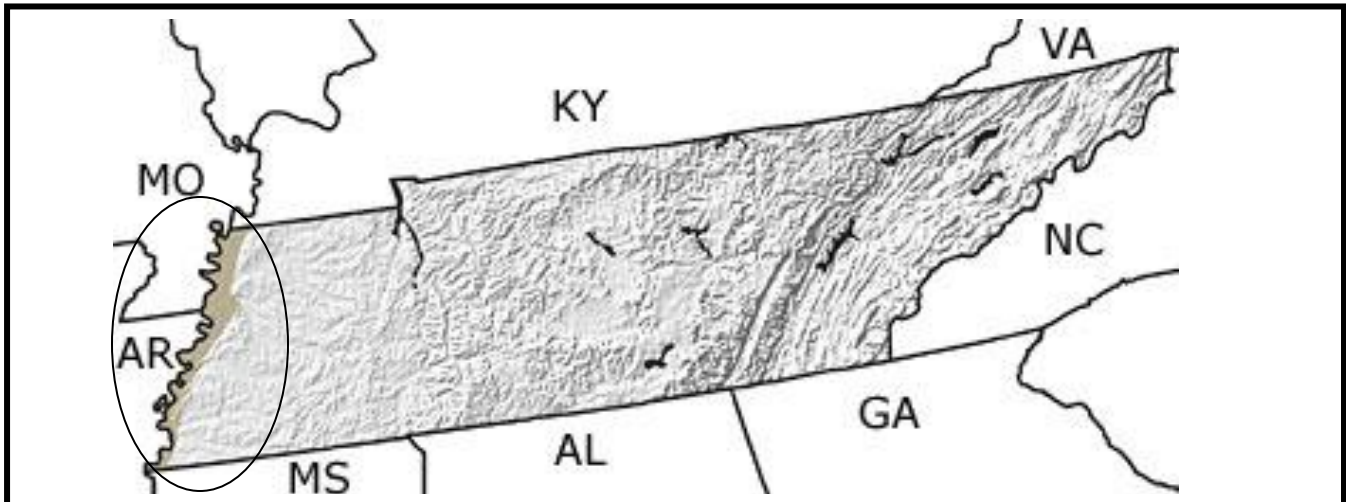
The Cenozoic: During the Early Cenozoic (Tertiary), warm, tropical marine waters periodically advanced across western Tennessee, while the rest of the state remained above sea level. Molluscs and other typical marine organisms have left their fossils in the marine rocks; elephants, tapirs, alligators, and other animals roamed a landscape of swamps, forests, and

Geologic Periods

0-1.8	<u>Quaternary</u>
1.8-65	<u>Tertiary</u>
65-145	<u>Cretaceous</u>
145-200	<u>Jurassic</u>
200-251	<u>Triassic</u>
251-299	<u>Permian</u>
299-359	<u>Carboniferous</u>
359-416	<u>Devonian</u>
416-444	<u>Silurian</u>
444-488	<u>Ordovician</u>
488-542	<u>Cambrian</u>
542-4650	<u>Precambrian</u>

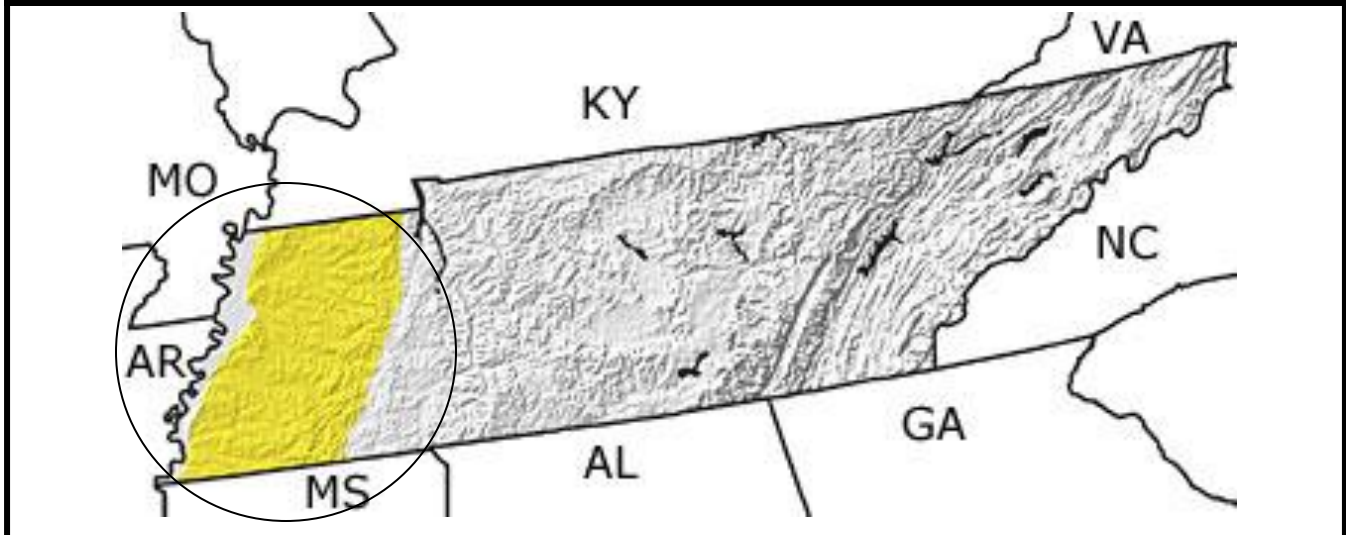
ivers. The ice sheets that covered parts of North America in the Late Cenozoic (Quaternary) did not extend as far south as Tennessee. However, fossils of mastodons found in the state tell us that the climate did become significantly cooler during this time.

Tennessee – Cenozoic and Mesozoic Eras



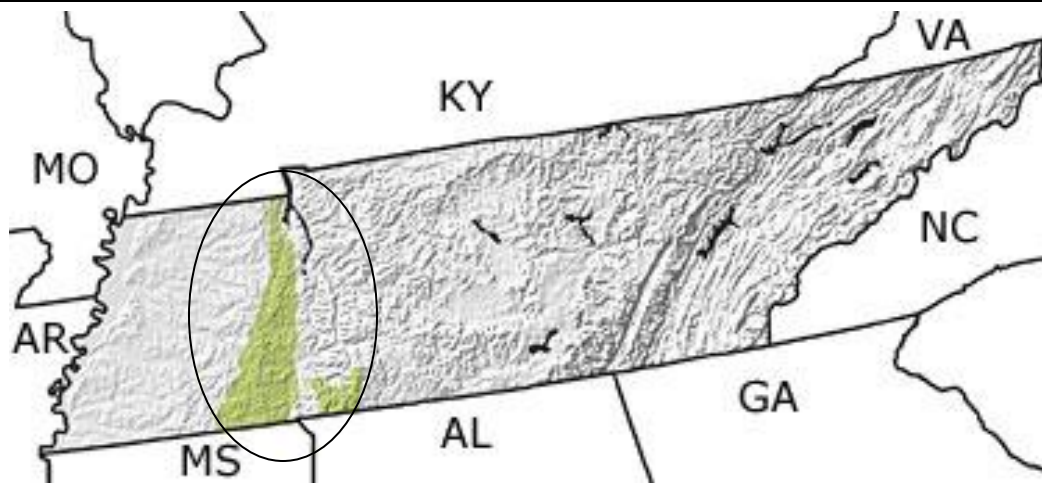
Quaternary Period

Quaternary sediments are exposed in a band along the western border of the state; material of this time interval occurs in other parts of Tennessee, but the exposures are too small to show up on this map. One such area is in Williamson County in central Tennessee, where two mastodon skeletons have been uncovered at the Coats-Hines site.



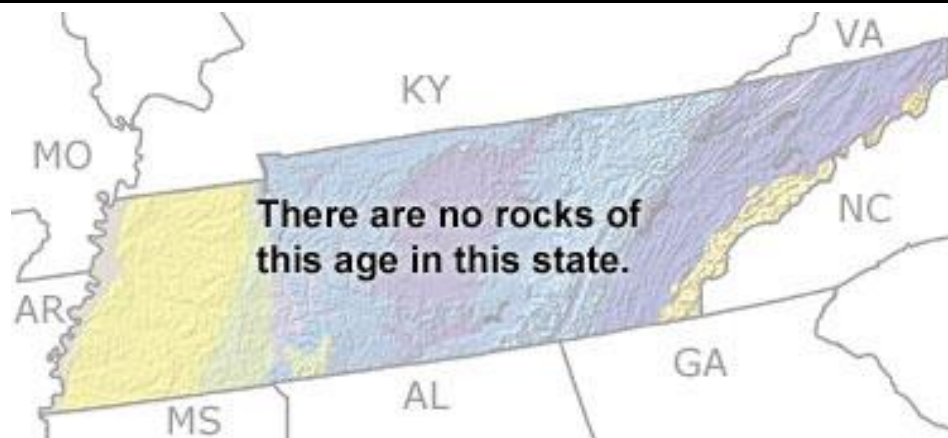
Tertiary Period

A warm tropical sea periodically flooded western Tennessee during the Tertiary. Fossils of marine organisms can be found in these sediments. The eastern part of the state was above sea level, and the landscape was dominated by large rivers, swamps, and forests. The Gray Fossil Site in far northeastern Tennessee (Washington County) was discovered during road construction in 2000 and appears to represent an ancient sink hole into which many animals fell and were trapped. Fossil remains include rhinoceros, the short-faced bear *Plionarctos*, a gomphothere (an early elephant), tapir, peccary, a badger, a lesser panda, and alligators.



Cretaceous Period

Cretaceous rocks are exposed in a north-south band across western Tennessee. These rocks are part of the Mississippi Embayment, an area covered by a shallow sea that flooded the region as North and South America moved farther apart during the breakup of the supercontinent of Pangea. Invertebrate fossils are abundant in these rocks, including clams, oysters, snails, and crinoids. The official state fossil of Tennessee is a small bivalve, *Pterotrigonia thoracica*, found in Cretaceous rocks. The only dinosaur bones found thus far in Tennessee are those of the plant-eating hadrosaur *Edmontosaurus* that lived during this time.



Jurassic Period

Most of Tennessee was above sea level during the Jurassic. As a result, erosion outpaced deposition, and there are no rocks of this age found in the state.

Triassic Period

Most of Tennessee was above sea level during the Triassic. As a result, erosion outpaced deposition, and there are no rocks of this age found in the state.

The East Tennessee State University (ETSU) & General Shale Natural History Museum Visitor Center and Gray Fossil Site

In late May of 2000 fossils were discovered by a Tennessee Department of Transportation (TDOT) road construction project on the outskirts of Gray, Washington County, Tennessee. TDOT employees, researchers from UT-Knoxville, and the State Archaeologist recognized the potential significance of the site and sought to protect it. On September 15, 2000, the governor announced that the road project would be relocated to save the fossil site for research and education.

The Miocene Collection – The majority of the fossils stored here have been excavated from directly behind the museum at the Gray Fossil Site. These fossils are dated in the late Miocene, about 4.5 to 7 million years old. The Gray Fossil Site Miocene Collection features the world's largest discovery of fossil Tapirs, particularly an extinct variety known as *Tapirus polkensis*, the dwarf tapir and new species of Red Panda, *Pristinailurus bristoli*, and Woodland Badger, *Arctomeles dimolodontus*.

The Pleistocene Collection – The museum contains a sizeable collection of Ice Age Fossils including peccary, deer, tapir, horse and carnivore scat material collected with permission from a location commonly known as "Guy Wilson Cave". The rest are from the nearby Saltville, Virginia fossil site, a salt lick that has preserved many Ice Age Mega-fauna including Mammoth, Mastodon, Giant Short-faced Bear and evidence of predation by Dire Wolf.

Gray Fossil Site Excavations – 2013 Field Season

Alligators, red pandas, camels, and beavers have highlighted the 2013 field season at the Gray Fossil Site. Throughout 2013, paleontologist found new species and added a variety of specimens to the collections of fossils that have been found during previous dig seasons. "This has been a good year for us," said Dr. Steven Wallace, museum curator and Gray Fossil Site director "We had a busy field season and were able to find a new beaver, horse material, more panda, camel, and more than one 3D tapir skull. Several of these finds were from our spoil piles, which are piles of dirt that were moved during construction of the museum in 2005."

The 2013 finds include a second type of beaver, which was found in the spoil piles. The first one, found several years ago, is the size of a muskrat. This new find is the same size as beavers today. Having two types of beavers at the same locality suggests that they had very different lifestyles; otherwise they would be competing for the same resources. Alligators have been a highlight from the dig season as well. A nearly complete skeleton with skull and jaws was recovered late in the field season. Several isolated bones found near the primary alligator skeleton, suggest that a second individual is present. Paleontologists hope to recover more of this second individual next summer.

A tibia, or shinbone, similar in size to that of a Fisher, a medium-sized member of the weasel family, was found in several pieces. One section was recovered in place, whereas the other was within a jacket containing alligator material. "We haven't found any carnivorans of this size," said Wallace, "so the tibia represents a new species for Gray!"

A summer-camper found a peccary tusk in one of the spoil piles. Peccaries are America's version of a pig. Today's peccaries are much smaller than the fossil forms found at Gray. Most live in Central and South America, but the collared peccary spills into southwestern U.S. deserts. "Even though we have at least three kinds of peccaries at Gray, they are rare at the site, so every specimen is important," said Wallace.

Several other rare finds were discovered during the field season, such as a camel hoof core, which is significant because camels are rare at Gray. Excavators also uncovered a few 3D tapir skulls, which are unusual because sediment in Gray is clay as opposed to rock, so fossils have been compressed over time, which leads to most skulls found at Gray being crushed. Museum preparators generally spend several weeks piecing together each skull found. Paleontologists also found more red panda material, which is becoming one of the common animals at the site. Red panda fossils have been recovered in all the test pits at Gray. Some of the panda fossils found represent individuals that are at least three times the size of a living red panda.